

## ***Interactive comment on “A Deep-Learning Hybrid-Predictive-Modeling Approach for Estimating Evapotranspiration and Ecosystem Respiration” by Jiancong Chen et al.***

### **Anonymous Referee #2**

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The topic is very interesting, but the manuscript needs strong improvements and clarifications. Main concerns are on i) Reco, which is included as second variable in the study, while the net ecosystem exchange (NEE) can be more appropriate because it is the actual key term of ecosystem carbon exchanges and it is also directly estimated by eddy covariance based towers (see comment 1), ii) HPM seems interesting but key elements of the model calibration are not provided (e.g., time and spatial scales, parameters), iii) innovative and relevant findings need to be clarified, showed and highlighted.

Detailed comments:

C1

- 1) Row 34: why Reco? I can't understand why the second variable considered in the study was the ecosystem respiration. It is not observed directly by FLUXNET network, but can be estimated indirectly from net ecosystem exchange (NEE) measurements made by eddy covariance towers during the night. The main term is NEE, why are you not considering it directly? NEE is the key variable considered worldwide. Please, include NEE.
- 2) Rows 101-105: please, include also SENTINEL 2, the new satellite for NDVI observations with better time and spatial resolutions, available from 2015.
- 3) Rows 162-165: mean annual precipitation of the watershed is 1200 mm/y. Hence, how can be representative these stations?
- 4) Rows 194-196: basin area? slope?
- 5) Row 207: why 16 locations? And not 10 or 20? Please, any sensitivity analysis? Any uncertainty estimate?
- 6) Equation (1): this equation is the NDVI definition, you don't need to include in the text, it is well known.
- 7) Row 264: please, include time resolution of the model, its space resolution, and the size of the domain.
- 8) Row 291: how is estimated  $g$ ?
- 9) Row 300: how are estimated  $W_f$ ,  $U_f$ , and  $bf$ ?
- 10) Row 318: how many parameters in total?
- 11) Equation (10) and (11): you don't need to include these equations. These are statistical index very well known.
- 12) Row 362-363: I looked at section 4.1 and it doesn't estimate any temporal dependency. It just tested the model at a not very clear time scale

C2

- 13) Row 374: again, what is the time scale?
- 14) Row 390: is it always at monthly time scale? please, again, define the time scale
- 15) Row 396-307, “. . .which also indicates that soil moisture data is necessary to increase Reco prediction accuracy in this ecoregion. . .”: how can you support this statement?
- 16) Row 415: Are the model parameters changing for each site? What are the parameter values?
- 17) Row 419-420: I don't agree, Reco predictions are not good in US Whs and US Var
- 18) Row 518-519, “This result indicates small-scale meteorological forcing and vegetation heterogeneity are the major controls of differences in ET and Reco at the East River Watershed”: please, highlight and clarify what is the new finding. We know already that meteorological forcing (which is the model input), and vegetation heterogeneity (model parameter) are the controlling factors of the model.
- 19) Row 673: please add the journal name of this reference, I can't find it.

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